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METAPHORS IN THE PSYCHOLOGICAL LANGUAGE

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1. INTRODUCTION

It is since ancient times that metaphors have been used in language for a variety of scopes. The following chapters will address the role and implications of metaphors in the descriptions of mental phenomena. To do that, I collected scientific papers, essays, and scientific books chapters on the topic to conduct an empirical research.

The first chapter endorses the definition of metaphor and its ability to provide insightful descriptions of abstract concepts otherwise impossible to conceive; here, it is thus stated how metaphors go beyond mere ornamental and poetic expressions. Moreover, it is debated the systematic nature of metaphorical concepts and thus of the metaphorical language. Finally, it is presented an overview of the three main types of metaphorical concepts according to Lakoff and Johnson.

In the second chapter, a 90-year analysis of mental metaphors' development is presented. Many mental metaphors have been individuated from the end of 1800 until the 70s of the last century, four main types, precisely. Each of them highlights different mind's aspects, therefore they also underlie a particular theoretical perspective in psychology. In the end, it is illustrated what makes a metaphor a valuable tool for researchers in their scientific writings.

In conclusion, the final chapter is dedicated to the evaluation of the sociological implications underpinned by the adoption of a single metaphor. As an exemplification, it is discussed how two leading metaphors for the concept of learning have positively or negatively shaped its interpretation and how the reliance on only one of them is dangerous and limiting for the scientific community.

2. METAPHORICAL CONCEPT

“Metaphors we live by” is the publication of Lakoff and Johnson that in 1981 renovated the interest in metaphors’ phenomenon in the fields of cognitive linguistic and cognitive science in general. The authors suggested that metaphors are not a simple tool to ornate language, but “*an expression of the structure of thought*” (Moser & Karin S., 2000, p. 3). The structure of our concepts is not confined to our intellect, but also touches our general functioning in daily activities, starting from what we perceive, what we experience, to how we interact in the social domain. Since we are not quite aware of how our conceptual system is like, Lakoff and Johnson looked at communication language to investigate its structure more in depth. What they found, from linguistic evidence, is that most of our daily conceptual system has a metaphorical nature. To clarify this idea, they further made the example of a conceptual metaphor: “argument is war”. This concept is metaphorical in the sense that the culture embracing it would conceive arguing as a war; namely, an act presupposing at least two opponents that try to prevaricate the other interlocutor by attacking his/her position and defending his/her own. The argument finishes with either a defeat or a win. The “argument is war” metaphor reflects a verbal battle, and it structures the behaviors we carry out in arguing. This is the essence of a metaphor according to Lakoff and Johnson, “*under-standing and experiencing one kind of thing in terms of another*” (Lakoff G., & Johnson M., 1981, p. 9).

Taken all this for granted, the authors concluded that metaphors are central in conditioning our everyday actions. Their work resulted in a publication resonance by many other authors coming from different study areas (computer science, philosophy of language, cognitive anthropology) interested in the topic.

Many works in the study domain of cognitive and experimental research have demonstrated metaphors’ power and richness in making sense of the world, and in offering the fundamentals to acknowledgments, decision-making, and action. Some instances are the works of Johnson-

Laird (1983,1989) that studied metaphors as models of the mind, while Gentner and Stevens (1983), Vosniadou & Ortony (1989) analyzed them in terms of analogical reasoning and problem-solving tools. Further, experiments by Dutke (1994) exploited analogical models in the explanation of software ergonomics; more recently, Ottati, Rhoads and Graesser (1999) highlighted metaphors' influence in communication processes.

2.1 What is a metaphor

Different study domains have tried to give a thorough definition of what a metaphor is and to explain the cognitive process that gives rise to the production and comprehension of the phenomenon. According to the discipline interested in the subject, it is possible to find several definitions of a metaphor (Tendahl & Gibbs 2008). However, it has become traditionally accepted to define it as an exchange of words with different meanings (a relationship of similitude); as an aesthetic or rhetorical linguistic analogy between two entities sharing similar qualities or properties (a figure of speech); or as an artificial linguistic comparison, constituted by the application of a descriptive term to an idea that differs from another one which is yet analogous to the first entity (Feldman 2008; Kövecses 2010; Zanotto et al. 2008).

In contrast, Lakoff and Johnson suggested a new conception of metaphorical thought: the Conceptual Metaphors Theory, which claims that linguistic and written expressions of metaphors represent a form of metaphorical projections useful to comprehend abstract concepts of knowledge (target domain). Metaphors act by the establishment of analogical relationships between the target domain and the source domain, which represents a more concrete area of knowledge. This process is called metaphorical mapping (Lakoff & Johnson, 1980).

If we rely on this theory, metaphorical means are not mere rhetorical adornments to language, but a valuable tool to the progressive acquaintance of quite vague study areas. The use of

metaphors for the comprehension is done consciously, on the level of thinking, meaning that it is central in the whole human conceptual system, and it is not only limited to poetic or discourse productions. In other words, metaphoric reasoning shapes and actively guides our cognition, allowing to give a powerful significance to the world's aspects that would otherwise remain too abstract and vague, since we would not have direct access to them (Hellmann et al., 2013; Jia and Smith, 2013).

To better elucidate this point, the authors proposed an example of figurative speech: “the time will come when...”. As humans, we need this trope in order to conceive time. Since we do not have any sensorial access to the concept of temporality, we conventionally linked it to the physical/spatial domain by means of the metaphor “time is motion”. For CMT, “*it is precisely these perceptive and motor interactions between humans and their environment that make up the basis of metaphorical thought*” (Alessandroni N., 2017, p. 5).

Therefore, what this theory constitute is an operational consistency between action and thought, which traces back to Jean Piaget's developmental theory (1936-1981).

2.2 Metaphorical concepts and their systematicity

In the previous chapter, the fundamental claim that has been made is that metaphors are radicalized in our conceptual system, and this allows metaphorical linguistic expressions to be possible. Therefore, whenever we speak about metaphors, such as “argument is war”, we are referring to metaphorical concepts.

Metaphorical concepts are systematic, meaning they always follow a pattern. If culturally adopted, the metaphor “arguing is war” reveals that we conceptualize arguments as battles, which follows a scheme: attacking, defending, strategy, win, gain. Because this metaphorical concept is systematic, the linguistic expressions we use to talk about the concept is also

systematic; for instance, we would use the same vocabulary of war if we were to discuss about the nature of arguing (attack a position, undefendable, rhetorical strategy, etc). Thus, since metaphorical concepts and metaphorical language are systematically linked, metaphorical expressions can serve as a basis to analyze the nature of metaphorical concepts and better acknowledge how the latter systematically influence our behavior.

Metaphorical mapping (Lakoff & Johnson, 1980), the prominent mechanism discussed earlier that generates new word meaning by mapping a pre-existing sense of a word from its source domain to another target domain, leads us to systematically focus on one aspect of a concept and neglect other ones. By concentrating our attention only on the verbal battle that arguing implies, we overlook other features which are inconsistent with the metaphorical concept. For example, we might not consider the cooperative aspect of arguing: the interlocutor is giving us time, offering new ideas, making an effort for the mutual understanding.

Therefore, Lakoff and Johnson (1981) concluded that metaphorical concepts offer a partial understanding of the concepts of interest, argument for example. They further underlined that, in cases like this, metaphorical structuring is not total, but partial: an argument is not actually war, but it is conceptualized and conceived in terms of a war. Hence, “*part of a metaphorical concept does not and cannot fit*” (Lakoff G., & Johnson M., 1981, p. 15), however a metaphorical concept can be used beyond its literal meaning and coextended into a figurative language and thought. “. *So when we say that a concept is structured by a metaphor, we mean that it is partially structured and that it can be extended in some ways but not others*” (Lakoff G., & Johnson M., 1981, p. 15).

On the other hand, metaphorical mapping’s directionality is not always systematic: the changes in words meaning could be unpredictable. Some words begin with a relatively concrete sense and evolve in more abstract significance, or vice versa. For instance, the word “irritable” originally embodied an abstract sense of personality (eg. an irritable person) (Kay et al., 2015),

and then developed a concrete, physical meaning (eg. an irritable skin) (Kay et al., 2015). The evolutionary change a word follows might be conditioned by cultural instances and by the historical need to always modernize communicative language.

However, some researchers argued that metaphorical meaning's direction might be systematic because "*it is shaped by enduring functional pressures on language evolution*" (Yang Xu, Barbara C. Malt, Mahesh Srinivasan, 2017, p. 2). Some computational cognitive science studies have justified the cross-linguistic variations with the necessity to build linguistic structures that reduce cognitive effort and sustain informative communication and language learning (Zipf, 1949). By relying on this suggestion, metaphorical mappings will systematically go in the direction of their easiness of construction, effectiveness in communication, and learnability by children (Yang Xu, Barbara C. Malt, Mahesh Srinivasan, 2017).

2.3 Structural metaphors, orientational metaphors, and ontological metaphors

Once again, Lakoff and Johnson have found that our cognitive system is largely metaphorical in nature. This means that it is structured by metaphorical as well as non-metaphorical concepts. The latter are those that arose from direct experience and are conceived by their own terms, while metaphorical concepts are understood in terms of non-metaphorical concepts; this involves conceptualizing one kind of object or experience in terms of another object or experience (Lakoff G. & Johnson M., 1980).

According to the authors, there are three main kinds of metaphorical concepts: structural, orientational, and ontological metaphors. They all derive from the interaction between our environment and our own bodies, and from our knowledge of three domains: our bodies, our relationship with the natural world and our subjective cultural reality, and our interaction with cultural items. To build up a metaphorical projection, we need to link two domains, like

temporal and physical areas. Our capacity to create this phenomenon, referred to as cross-domain mapping, is influenced by the different topological domains' structure and their ability to form informational relationships. In other words, metaphorical mappings imply the projection of certain aspects of a domain onto another domain (target domain).

Structural metaphors involve the mechanism we have discussed thus far, that is the conceptualization of an experience, object, or activity in terms of another type of experience, object, or activity. Instances are the metaphor ARGUING IS WAR, which we have already analyzed, or UNDERSTANDING IS SEEING, like "I see what you say", "I've got the whole picture now", which conceptualizes the understanding process in terms of the basic sense of sight.

Oriental metaphors are those that are structured on the basis of spatial orientation: up-down, in-out, front-back, on-off, deep-shallow, central-peripheral. These metaphors derive from the interaction between our body's way of functioning in the natural world and our cultural experience. This implies that metaphorical orientations are not arbitrary. The terms up-down, in-out, wide-narrow, etc, are all physical in nature, and the metaphors deriving from them assume different meanings and structures in virtue of a specific culture. For instance, in some cultures the future is conceived as forward, as in front of us, while in others it is placed behind us. Here some hints on how the following orientational metaphors have arisen from our physical and cultural experiences.

RATIONAL IS UP, EMOTIONAL IS DOWN:" The discussion fell to the emotional level, but I raised it back up to the rational plane". In our current culture, humans feel like they are in power over animals, plants, and the rest of the physical environment because they have a quality the natural world do not own: rationality. According to people of our society, human beings are on a higher status compared to animals, thus they are legitimated to take control over them.

Thus, MAN IS UP is based on the assumption that CONTROL IS UP, leading to the conclusion that RATIONAL IS UP.

CONSCIOUS IS UP, UNCONSCIOUS IS DOWN: “I woke up when he fell asleep” or “she is under hypnosis”. The orientational direction the unconscious embraces is given from the fact that humans and most other mammals sleep in a supine position. When they are awake, they assume an erected position.

We can find a systematicity among the multitude of orientational metaphors, which convey them coherence. For example, GOOD IS UP orientates the overall well-being onto an upward direction, which is coherent with other conceptual cases like JOY IS UP, HEALTH IS UP, STATUS IS UP, CONTROL IS UP.

These metaphorical conceptualizations expressed via orientational directions point out the idea that to build a metaphor it is necessary an experiential background, both in terms of knowledge of us and the natural world, and in terms of cultural and social influences. At times, it is not simple to differentiate between the social and the physical nature of a metaphor, since *“the choice of one physical basis from among many possible ones has to do with cultural coherence”* (Lakoff G. & Johnson M., 1980, p. 19).

Oriental metaphors are useful tools to comprehend many aspects of our existence, but one should not limit his knowledge to spatial terms. Another source of acknowledgment are concrete objects and entities, which allow us to identify aspects of our experiences as phenomena grouped in the same topological category. Ontological metaphors, thus, find their structure from the experience we make of the world and of ourselves (physical objects).

THE MIND IS A CONTAINER: “His brain is packed with interesting ideas”. “Someone needs to clear my head”.

THE MIND IS A MACHINE: “My mind just isn’t operating today”. “We’ve been working on this problem ah day and now we’re running out of steam”.

These mental metaphors refer to different kinds of objects which lead us to conceive cognition under different lights. The machine metaphor likens the mind to an operational apparatus that has a productive capacity, a level of efficacy, and a source of energy. Container metaphors instead turn our brain into a storage that can be filled or emptied with information, ideas, emotions. As humans, we are containers, physical beings delimited from the outer environment by our skins, and we have an in-out orientation, which we transpose onto other items bounded, in turn, by surfaces. We are then prone to see things as containers having an inside delimited from the outside (Lakoff & Johnson, 2003).

3. HISTORICAL CHANGES IN MENTAL METAPHORS: A 90-YEAR OVERVIEW

In a study conducted by Dedre Gentner and Jonathan Grudin (1985), it has been shown and analyzed the evolution of the metaphors drawn by American psychologists to describe mental phenomena. This research aimed at understanding if and how changes in the metaphoric language were correlated to changes in the conception of the mind held by the psychologists.

A field that concretely shown a rapid and concise evolution of mind conception is cognitive psychology. For instance, this area of psychological study saw the dialectic between structuralism and functionalism, followed by Gestalt’s school of psychology, behaviorism, and finally information processing. The authors’ assumption was that metaphoric thought was reflected in the metaphors employed in language, namely the metaphoric language represents the relationship between the domain to be explained (target domain) and the analogical domain. However, they pointed out that it might be simplistic to assert a direct causal relationship between a metaphorical language and an underlying conceptual model linked to the metaphor. Nevertheless, many studies on the history of science have proven how metaphoric analogies

have served as tools to create and arrange ideas, and that many psychological theories have been impacted by metaphors from other study domains. Therefore, taken for granted the assumption that the metaphorical language is a mirror for the way psychological researchers conceive the domain, the authors' hypothesis is that shifts in the metaphors drawn to depict mental mechanisms may be a fair indicator of changes in the conceptual paradigms used in American psychology.

To prove their hypothesis, the researchers have sampled 48 *American Review's* articles containing mental metaphors from 1894 to 1985. The metaphors were then divided into categories according to their analogical domain, and finally the frequency of appearance of each type of metaphor was traced throughout this historical time period, which they conventionally divided into three tridecades: early (1894-1815), middle (1925-1945), and recent (1955-1975).

3.1 Mental metaphors: categorization and frequency

A mental metaphor was defined by the authors as “*a nonliteral comparison in which either the mind as a whole or some particular aspect of the mind (ideas, processes, etc.) is likened to or explained in terms of a nonliteral domain*” (Gentner, D., & Grudin, J., 1985, p. 182). They found a total of 265 metaphors for mental phenomena and sorted them into four major categories: animate-being metaphors (23 instances), neural metaphors (16 instances), spatial metaphors (61 instances), and systems metaphors (80 instances). It should be mentioned that the count of metaphors represents the number of types, not the number of tokens in each article. Namely, only one instance of each metaphoric term or phrase was collected from a given article.

Animate-being metaphors refer to ideas or aspects of the mind compared to human or non-human creatures; neural metaphors are those likened to the human nervous system; spatial metaphors are analogue to the distribution or movement of object in space; finally, system

metaphors are connected to systems of consistently constrained interactions among elements, for example mathematical and physical systems. Instances of the categorization process is illustrated in Table 1 for early, middle, and recent periods.

Table 1

Examples of the Four Major Categories of Metaphors by Tridecade

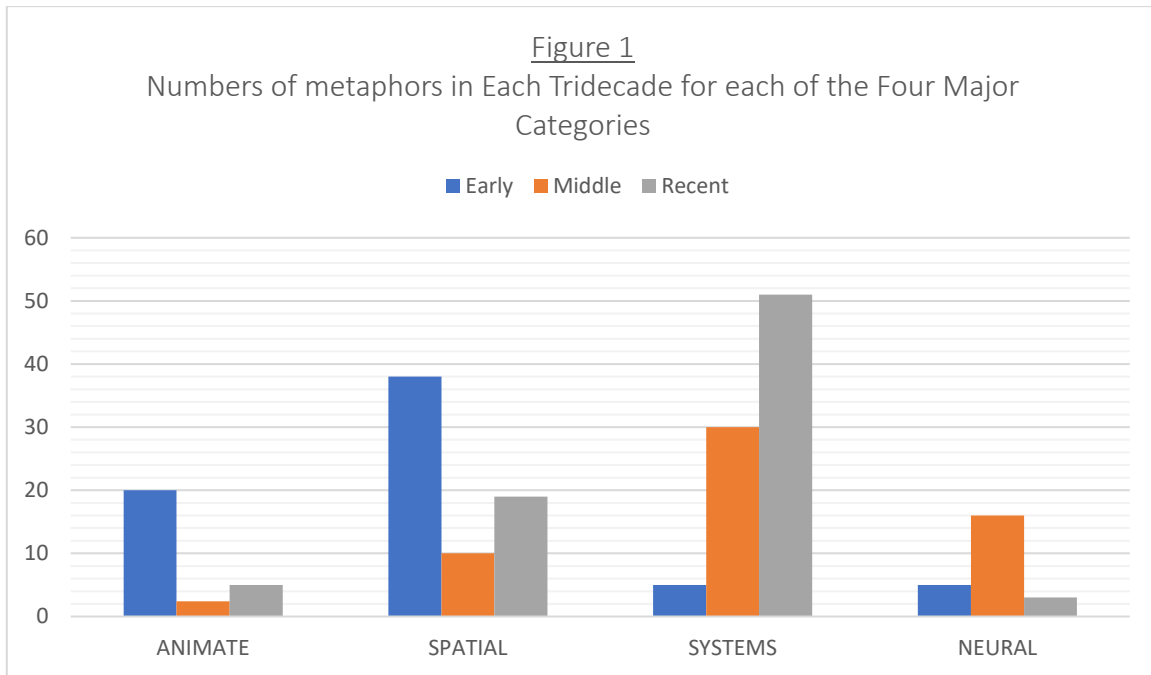
	Early (1894-1915)	Middle (1925-1945)	Recent (1955-1975)
Animate-being	Ideas struggle with one another (James, 1905)	Reaction arcs block each other, varying in tension, until one waxes strong enough (Dashiell, 1925)	Ego defenses (Minard, 1965)
Neural	Association among images, like white matter connecting regions of grey matter (Starr, 1894)	Anger shortcircuits excitation into the parasympathetic system (Arnold, 1945)	Inhibitory processes (Zwicker & Scharf, 1965)
Spatial	Anything hiding in the background is not mental activity (James, 1905)	Habitual connection between ideas (Peterson, 1935)	Reservoir model for fixed action pattern (Moltz, 1965)
Systems	A body moves in empty space by its own momentum as when our thoughts wander at their own sweet will (James, 1905)	Nervous system is like a switchboard mechanism (Gray, 1935)	Serial iterative operations (Carpenter & Just, 1975)

By analyzing the pattern of distribution of the different types of metaphors, the authors first compared the number of metaphors of each of the four major categories used in each of the three tridecade blocks.

In the first tridecade, spatial and animate-being metaphors are the most predominant ones, but then they showed a sharp decline in the following years. System metaphors, on the other hand, gradually started to be in vogue from the second tridecade and peaked in the recent period. Finally, neural metaphors showed a constant frequency through time, and unlike the other three categories, they did not decrease in number during the middle period (1925-1945).

The analysis has revealed a U-shaped pattern in the total numbers of metaphors employed in the three tridecades. What emerges is that mind metaphors are high in frequency at the extremes (early and recent periods) of the historical period of interest and drop critically from 1925 to 1945 (middle period).

To sum up, there has been a significant decline in the use of animate-being and spatial metaphors after the first tridecade, while system metaphors showed the opposite trend: beginning as a negligible category and finishing off as the most prevalent one. In conclusion, no shift in their frequency use happened for neural metaphors, which remained at a constant number. The major four categories of metaphors' frequency can be seen in Figure 1.



3.2 Explanation of the frequencies' shift

The metaphors' shift through these years is an interesting starting point to look into the development of psychological thoughts.

The prevalence of spatial category metaphors from 1894 to 1915 (first tridecade) might be due to the progress of photography. For instance, there were many allusions to photography terms, like "memory image" (Bryan, 1894) and "mental picture before the mind's eye" (Haines & Williams, 1905).

Although the spatial category of metaphors showed a sharp decline after the turn of the century, it should be noted that many system metaphors have a spatial basis, as most of mental metaphors. This is probably due to the familiarity spatial metaphors evoke, since perceptual space knowledge is among the best understood area for humans. This means that spatial metaphors' decrease does not imply a decline in the relevance of spatial information, but rather it points out a greater reliance on analogies likened to system items which overcome the mere

spatial domain. For instance, the computer system metaphor is a clear example of how to explain the conception of ideas moving (spatial category) into consciousness.

Following the authors' reasoning, the U-shaped pattern depicted previously is due to the influence of the behaviorist school of thought, which articles were a mere reportage of pure data. This approach led to an avoidance of discussions and explanations of the mind's internal workings. Therefore, in that historical period, mental metaphors became less dominant, and left pace to more mathematical models of the behavioral processes. Examples of those metaphors are "goal gradient" (Dennis, 1935), and "neural flux" (Gray, 1935) for neural metaphors.

Conversely from spatial metaphors, system metaphors became popular from the 30s and gained importance exponentially. In that period, many other domains, such as mathematics, physics, and computer sciences, used to draw metaphors likened to systems, especially mechanical systems.

It is deducible that technological inventions have been the basis for metaphors' drawings. Consequently, one can think that psychological metaphors are the mirrors to new technologies, and/or that those same metaphors will be also found in the writings of other scientific domains. As seen earlier, the photography metaphors were in vogue precisely when photography was fabricating its science, reflecting the tendency of researchers to tap into newfound accessible technology to build up analogies.

Despite that, it is still not quite clear how technology can influence the shifts in analogical domains. It is true that new technological advancements are a useful tool to draw metaphors from, but it is also true that the mere emergence of a new technology does not automatically imply its adoption in the creation of mental metaphors. For instance, in the last century, cybernetic, aviation, nuclear power, and television have grown up a lot, and yet we find few analogies underlying these domains. Mental metaphors are thus chosen in a more selective manner from researchers, who do not simply borrow concepts from the newest technology.

According to Gentner, D. and Grudin, J.'s hypothesis, authors of psychological manuals have tried to explain mental processes by selecting the best suited metaphors for their scientific approach to the domain. In other words, mental metaphors' shift is perhaps a consequence of changes in current of thought in psychology. For example, "*the neural flux metaphors used in the middle tridecade may reveal the influence of Gestalt psychology; the mathematical systems metaphors may be linked to the advent of information processing in cognitive psychology*" (Gentner, D., & Grudin, J., 1985, p. 189).

3.3 The qualities of a valuable metaphor

In the end, the authors analyzed the reasons that motivated American writers of psychological manuals to choose a particular metaphor against another, and the role these metaphors were meant to serve in a descriptive context. To do that, they addressed three issues: the role of metaphors, eventual quality differences in metaphors, and, if so, assessment of any improvements in metaphor quality over time.

For the first question, the researchers suggested that a metaphor' role depends on the user's intention. Generally, though, analogies are adopted to convey "*an overall sense of complexity or potential richness without necessarily specifying precise mappings between objects and relations in the analogical domain and the target domain*" (Gentner, D., & Grudin, J., 1985, p. 189). Further, in scientific elucidations, metaphors can serve as predictive tools in an unfamiliar context when relying on granted relationships between items in better known domains.

Secondly, according to the authors, precision, plausibility, and interesting and powerful consequences of the use of metaphors are the three parameters that should be followed to evaluate the quality of analogies. Precision refers to the extent to which relationships between objects of different domains are accurately defined and maintained. The plausibility principle

underlines whether the predictive nature of an analogy leads to a reasonable correct result. Finally, the last condition is about whether the derived predictions make up a “*coherent set of interrelated assertions*” (Gentner, D., & Grudin, J., 1985, p. 189). They further specify the greater explanatory predictive potential of systematic compared to non-systematic metaphors, whose instant predictions do not give rise to reliable conclusions.

Lastly, Gentner, D. and Grudin, J. wondered if and how any improvements in metaphors occurred. As seen in the previous chapter, system metaphors took over animate-being and spatial ones in the middle and recent period of the survey, even though the latter ones were quite valuable in their descriptive nature, and even more inventive. The authors suggested that psychologists started looking for more precise and less vague analogies, which were found in system metaphors, because they provided more systematic and explicative conclusions. Unlike the others, mathematical and physical systems as analogical domains offered a more concatenated net of propositions and consequent more valuable predictions, at least according to the psychologists’ conception of appropriate standards for an explanatory metaphor for their profession. For instance, the authors specify that it is not merely the degree of systematicity to make a metaphor effective, but also the precision and adequacy of the correspondences established, which have altered the preference towards system metaphors.

3.4 Final considerations

In conclusion, the overall pattern suggests that system metaphors, in particular computer system analogies, became the most predominant ones. Why computer metaphors? “Retrieving”, “detecting”, “searching”, “input”, “output” are all terms that can refer to both human cognition and machine processes, an ambivalence that sometimes ends up being a vague analogizing. However, computer metaphors’ systematicity can also be a powerful tool to simplify the description of phenomena proper of an entity with limited capacities.

According to the authors' deductions, what has really changed is not the quality of the metaphors, but rather the “*degree of vagueness tolerated in modeling*” (Gentner, D., & Grudin, J., 1985, p. 190) and the psychologists' preference for current analogies which are considered more favorable to advancements in the acquaintance of the mind.

4. THE IMPORTANCE OF A MULTIMETAPHORICAL METAFRAMEWORK

The title *Metaphors we live by* encloses the idea that the metaphorical linguistic expressions we choose project some expectations and features onto the target concepts. Therefore, the choice of a metaphor is a hugely consequential decision because the characteristics a metaphorical concept integrates will highly shape our way of reasoning and our behavior. Although metaphors allow us to conceive and understand many abstract domains, they also prevent us from crossing the boundaries set by the metaphors itself. Thus, we can say that we live by the metaphors we use.

Anna Sfard (1998) critically evaluated the implications of adopting only one metaphor when dealing with the concept of learning. She individuated two leading metaphors shaping the learning mechanism in our mind: *acquisition metaphor* and *participation metaphor*. Both of them lead to several entailments resulting from contextual factors and from the metaphors themselves. The author structured the analysis of the two metaphors and their consequences starting from how they impact on the learning conceptual framework and finishing off with an elucidation on the dangers of limiting the concept of interest to only one particular metaphor.

4.1 *Acquisition metaphor versus participation metaphor*

According to Sfard, nowadays educational research is represented by the dialectic between two main metaphors that she calls *acquisition metaphor* and *participation metaphor*, which are simultaneously present in the majority of the recent scientific articles.

Acquisition metaphor conceives human beings as containers that gain something. As Piaget and Vygotsky claimed, the act of acquiring information is called concept development. Concepts are pieces of knowledge that humans accumulate, refine, and combine with previously acquired ones to build a more complex cognitive structure. The two concepts “knowledge acquisition” and “concept development” convey the idea of the mind as a recipient to be filled with items which then become property of the learner. “On Having and Using Geometric Knowledge”, “Acquisition of Mathematical Concepts and Processes”, “Children’s Construction of Numbers” are just a few examples of titles of mathematical learning writings that underline that learning is an acquisition and accumulation process by development or by construction. Learning as a gaining process is present in several study framework, such as moderate and radical constructivism until interactionism and sociocultural theories.

On the other hand, the *participation metaphor* holds the conception of learning as becoming a member of a community and behaving following its values, which have to be negotiated in the process of community building. Under this perspective, the learner becomes an integral part of the collective. Some instances of writings’ title underpinning this approach to learning are the followings: “Development Through Participation in Sociocultural Activities”, “Cooperative Learning of Mathematics”, “Learning in the Community”. While in the *acquisition metaphor* learning is a process characterized by an endpoint, in the *participation metaphor*’s view there is a constant flux of doing. For instance, the learner is now seen as an individual willing to participate in certain kinds of activities rather than to accumulate private possessions. The

learner is then focused on the ability to communicate in the community's language and to act according to the team's norms.

4.2 Social implications of adopting one metaphor

These two perspectives on learning do not imply a controversy on the subject's definition, but rather offer different visions on the mechanism.

According to Sfard, the conception of knowledge as a commodity to be individually accumulated reflects our society's position on material wealth: "*when figuratively equated, knowledge and material possessions are likely to play similar roles in establishing people's identities and in defining their social positions. [...] Like material goods, knowledge has the permanent quality that makes the privileged position of its owner equally permanent*" (A. Sfard, 1998, p. 8). In this perspective, learning will tend to create distance among people rather than to bring them together. Acquisitional learners and scientists are then prone to rival and compete for intellectual achievements as society does for material goods. Terms like "gift" and "potential" are frequently employed to specify an inclination for learning and creating; they underpin a person's quality. Like other personal material possession, gifts and potentials are quantifiable and make way to a categorization of people's ability to be useful.

This *acquisitional metaphor's* interpretation is not the necessary result, it is not automatically inscribed in the metaphor itself, but still it is what the metaphor made way to. Furthermore, its normative consequences in society will be hold if the metaphor remains in first line, especially in a society that values the material wealth quest.

The *participation metaphor*, conversely, proposes the message of collectiveness, collaboration, and solidarity. It does not focus on the possession aspect of learning, but rather promotes the importance of being in action, in a constant flux. Whether the actions are productive or

detrimental, these adjectives apply only to the actions and not to the learner, who, despite his behavioral choices, has always a window of hope to see. In other words, the *participation metaphor* is more democratic in shaping the learning path. But again, since this metaphor's account is given and not etched in the metaphor itself, it is up to the learner to concretize the metaphor potential.

When dealing with social issues, *participation metaphor* is not less voluble to fatal interpretations and abuses than other conceptual frameworks. "*We can only protect ourselves from falling into such traps by constantly monitoring our basic beliefs*" (A. Sfard, 1998, p. 9), points out the author. The real power of the latter metaphor is that of an eye-opening source on the limitations of the *acquisition metaphor*.

In sum, despite the objectifying and hierarchizing aspects of the *acquisition metaphor*, it is almost impossible not to adopt the terms it proposes when discussing about learning. And even if one could come up with an acquisition-metaphor-free language, it would not be the best option. For instance, even by only adopting the *participation metaphor's* discourse, we would lose some important insights into the learning concept. The author reminds us that we are dealing with the theory of conceptual metaphor, namely any new concept (e.g., learning) can be only understood in terms of existing conceptual schemes which are transposed onto new domains. Consequently, we cannot avoid the two metaphors' conceptions and terminology, yet we must be aware of them and of their outcomes.

4.3 We need more than one metaphor

What the author mainly wanted to address throughout her discussion on learning and its metaphors is the idea that one metaphor is not enough to thoroughly discuss a topic. We need more than one metaphor because each of them offers resourceful perspectives on the matter,

and none of them can be exhaustive enough alone. “[...] *metaphorical pluralism embraces a promise of a better research and a more satisfactory practice*” (A. Sfard, 1998, p. 10). Translating Sfard’s discussion on the metaphorical concept of learning into a broader discourse, we end up with the granted idea that each psychological theorizing by means of metaphors should not be seen as exclusive, but rather a precious part of an in-process building framework of mental phenomena. If we only give credit to system metaphors, mentioned in chapter 3, for instance, we will excessively focus on the mechanical aspects of our mind and overlook the ones that instead deal with environmental influences, for example. If we instead combine system metaphors with animate-being metaphors, we will disclose the arbitrary nature of the generally accepted inferences of system metaphors’ interpreters. This disclosure will result in an instantaneous emancipatory effect (A. Sfard, 1998), which set the basis to produce a critical theory of the mind. “*Dictatorship of a single metaphor, like a dictatorship of a single ideology, may lead to theories that serve the interests of certain groups to the disadvantage of others*” (A. Sfard, 1998, p. 11), concludes Sfard.

In the end, multiplicity of metaphorical perspectives into one metaframework does imply a flexible and openminded approach to the subject but does not underpin arbitrary methodological freedom or decreased necessity for providing empirical evidence; any theoretical speculation always must ensure validity and reliability.

5. CONCLUSION

Metaphorical concepts are necessary for understanding most of what goes on in our world.

Modern cognitive psychology acts by using metaphors extensions for the mind and concepts already present in our cognitive system. For example, THE MIND IS A CONTAINER, IDEAS ARE OBJECTS, LINGUISTIC EXPRESSIONS ARE CONTAINERS, and THE MIND IS A

MACHINE. THE MIND IS A COMPUTER metaphor, when elaborated consistently and taken seriously, leads to the associated MENTAL PROCESSES metaphor. The consequence of taking this metaphor seriously is to conceive the mind as a processor able to execute functions either in parallel or in series. Like all other metaphors, this one will prioritize the observation of certain mental activities' aspects and ignore others. Therefore, it is inevitable that psychologists, by employing this metaphor, have been prone to discover mental phenomena mainly fitting the idea that the mind processes information in parallel or in series.

This metaphor effect does not imply that metaphors are wrong and should not be used freely; indeed, it is fundamental to recognize metaphors' indispensable nature for science, which would not be able to explore many abstract concepts. However, it is equally important to be aware of the limitations a single metaphor offers: it will always obscure indefinite sides of the world's reality.

The solution for a metaphor's preventing nature to a broad perspective is the application of several metaphors to embrace different aspects of the same concept. Notoriously, in a culture, a single concept can be addressed by different approaches that generate different metaphors for interpreting IDEAS and the MIND. Taken together and used as a homogeneous general framework, the different scientific approaches and the resulting metaphors, even if partially and frequently inconsistent with each other, functionally work for the purpose of thoroughly understanding better than any single metaphor could ever do.

In cases like this, consistency is not desirable for acknowledgment. By considering only one metaphor, we will be blinded and lead to ignore aspects of reality hidden by the metaphor. This is the systematic outcome of sticking to metaphor consistency, a result that Cognitive Science, and scientists in general, cannot accept if they want to have a full and rich understanding of human behavior and of the world' phenomena.

However, despite the tyrannic action a metaphor involves, like that of the technology from which it often arises, analogies are also a source of freedom (D. Edge, 1974); for instance, we have free will to decide by which metaphor we will be captured.

In conclusion, Cognitive Science needs to be aware of its metaphors, to be concerned with what they hide, and to be open to alternative metaphors even if they are inconsistent with the current favorites.

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